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What Happened to Flight 007?

Was the Airliner on an Unlucky Spy Mission or the Victim of Careless Pilot Error? Probably Neither, Says the Author, a Veteran Pilot. More Likely It Was an Early Navigation Error Combined with a Last-Minute Short Cut to Save Fuel. The Result Was the Soviet "Termination" of Flight 007.

By Russell Warren Howe

Ronald Reagan called it "one of the most infamous and reprehensible acts of history"—even a "major turning point in time." Most Western pilots refused to fly to Moscow for two months. Andrei Gromyko was barred from landing in New York and New Jersey and missed a UN session.

A Boeing-747 jumbo jet of Korean Air Lines had been blown out of the sky by a Russian missile. During the following week, 576 pieces of jetsam, including parts of bodies, washed ashore around Wakkanai on Hokkaido, Japan's northernmost island—about 200 miles from the ocean crash site. Another 167 pieces of flotsam were recovered from the waves by Japanese, American, and Soviet ships.

The Soviet Air Force's shoot-down of flight KE007 on September 1, 1983, had killed 269 innocent civilians in the freezing waters off the Siberian coast, leaving most of the world angry at Moscow—and also mystified as to how the plane came to be flying over Sakhalin island in the first place.

Two years later, the puzzle of why the airliner was in Soviet airspace remains officially unsolved. The digital flight-data recorder in the tail of the fuselage was never found—unless it was secretly found by the Russians. The same is true of the voice recorder from the cockpit. These are the two "black boxes"—which are actually painted orange to make them more easily recognizable on a midnight-black seabed or a desolate mountainside.

Because of the nature of the Soviet area, the theory that flight KE007 was on an intelligence mission soon gained credence and was strenuously pushed by Moscow. Earlier that fateful September morning, the 747 had crossed the Soviet Union's super-sensitive Kamchatka peninsula—which, in addition to exporting lobster to America, is also home to Petropavlovsk naval port, which berths 90 nuclear submarines, including about 30 with ballistic missiles aimed at the US. Kamchatka also contains several air bases and radar stations, and the missile-test splashdown area of Plesetsk.

To have flown over Kamchatak was bad enough; to have gone on to Sakhalin

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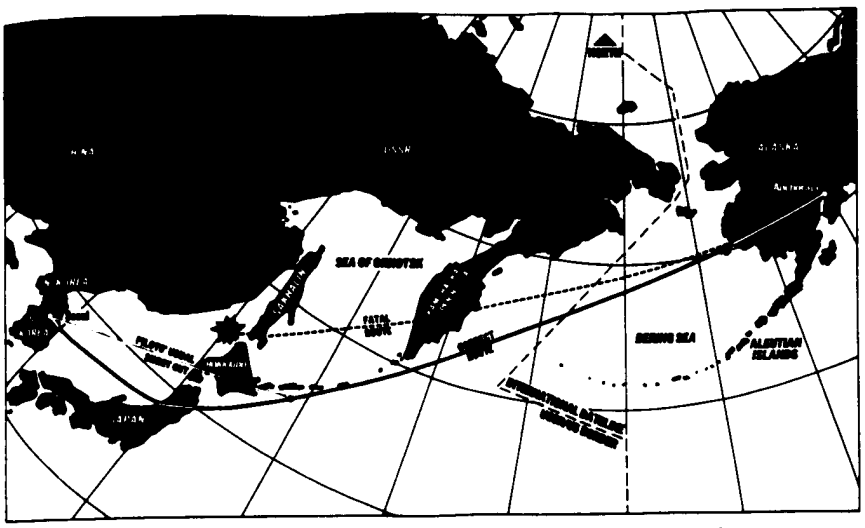

was very provocative.

Sakhalin, although no bigger than Baja California, is host to six military airfields guarding the Soya Strait—the 30 miles of water between Russia and Japan that constitute the gate to the open ocean for the Soviet Pacific Fleet, based at Vladivostok.

No flyer doubts that the region is sensitive. North Pacific flying charts are boldly marked AIRCRAFT INFRINGING UPON NON-FREEFLYING TERRITORY MAY BE FIRED ON WITHOUT WARNING. According to General George J. Keegan Jr., the former director of Air Force intelligence, six Soviet colonels and lieutenant-colonels have been executed, over the years, for failing to destroy intruding American planes.

Moreover, that night Soviet defenses had already counted five flights by US intelligence planes waiting for the launch toward Plesetsk of an experimental Soviet SS-X-24 intercontinental ballistic missile—a launch that some theorized might be a breach of the SALT II agreement. None of the five spy-plane flights had infringed Soviet airspace, but they came close. Was KE007 taking advantage of its civilian status to spy inside Soviet territory? Was it being used to trigger Soviet defenses, so that a Ferret-D satellite overhead could film the results? This led to the most fundamental question of all: Was the flight off course intentionally?

The Korean Air Lines 747 had arrived at Anchorage from New York around 3 AM Alaska daylight time. There was a routine crew change, refueling, and servicing. The Soviets claimed that takeoff was delayed 40 minutes so that the jumbo could rendezvous with an American RC-135 spyplane monitoring the missile test. In fact, KE007 took off one minute early, at 4:59 local time, 10 PM in Seoul, just right to put the plane into Seoul's Kimpo airport around 6 AM, when Korean customs and immigration clerks come to work.

The captain, Chun Byung-in, 45, was a meticulous and competent man. He had been with KAL for eleven years, after ten years in the air force, which he had left with the rank of major. A Presbyterian with a degree in economics, he had flown 10,627 hours, including 6,618 in 747s and five years flying in and out of Anchorage. Described by his employers as a "model pilot," and the recipient of a citation the year before for ten years of accident-free performance, he had occasionally flown his namesake, South Korea's President Chun Duhwan, on official overseas visits.

The first officer was Sohn Dong-hui, 47, who had joined KAL in 1979 after seventeen years in the air force, where he attained the rank of lieutenant colonel. He had flown 8,917 hours, including 3,411 in 747s and 52 previous North Pacific flights.

The flight engineer, Kim Eui-dong, was a graduate of the Korean Aviation College and was one of the new generation of pilots not trained in the military. In six years with KAL, he had acquired 4,012 hours, including 2,614 on 747s. The cockpit crew was as technically competent and experienced as any passenger could wish.

Also on board were a purser, three stewards, thirteen stewardesses, three armed anti-hijack sky marshals (the captain also carried a side-arm), and six pilots deadheading back from Alaska, for a total of 29 KAL employees.

Some of the 240 passengers could spread themselves over the 168 empty seats for the long night flight. In first class, along with the six deadheading pilots, the only paying passenger was Congressman Larry P. McDonald of Georgia, president of the John Birch Society, who was on his way to attend the 30th anniversary of the signing of the US-South Korea mutual-defense treaty.

KE007 was routed to fly R (for red) 20, one of four parallel routings from Anchorage to the Daigo navigational beacon in Japan, where the plane would turn right and cross the last stretch of ocean of its final leg into Seoul. R20 is the closest of the routes to Soviet airspace.

Aircraft join R20 at Bethel, about an hour west of Anchorage, and are soon beyond the reach of all American civilian radars. For 900 nautical miles, or about 100 minutes of flying, airliners are on their own, except for radio communication, until they are picked up again by Japanese radars. For this period, they are closely tracked only by Soviet controllers and invariably rely on inertial navigation systems, or INS. An INS is a computerized system of gyroscopes and other instruments that tells the crew precisely where the plane is, its altitude, speed, and other data. The INS is coupled to the autopilot, steering the plane along the chosen track.

Normally, an aircraft "tracks out" of Anchorage by steering the reverse of the Bethel-Anchorage track. But that night the Anchorage VOR navigational beacon was "down" for routine maintenance. In that situation, the pilot is supposed to track into Bethel on a prescribed magnetic compass heading, and then switch to INS.

From the start, this seems to have been an ill-fated flight. When First Officer Sohn radioed Anchorage that KE007 was over Bethel, the plane, according to its blip on the radar screen at King Salmon US Air Force Station, was actually twelve nautical miles north of the beacon and already on the fatal course that would take it into Russia. The Air Force did nothing about it; it had no responsibility for civilian planes. Between Bethel and Daigo are seven ocean way stations—points of latitude and longitude along route R20. Four of them are compulsory reporting points. All seven positions are programmed into the inertial navigation computer. As each waypoint approaches, two amber lights come on beside the pilots' INS panel; they go off as the plane passes over, or abeam (beside), the points. The first officer then radios Anchorage or Tokyo control with the flight's position.

Captain Chun's plane had radio problems. The incoming crew had reported that one of the three VHF (very high frequency) radios was "noisy." It was repaired at Anchorage and worked on the ground, but in the air it failed again. The other VHFs were also faulty. For KE007's communications with Anchorage, another KAL flight—KE015, heading for Seoul via Los Angeles—had to intervene and retransmit the exchange. In the airline world, such snafus are not unusual. Eventually, KE007 went onto

HF (high frequency) radio transmission.

Retracing KE007's odyssey from US Air Force and Soviet tapes, one can clearly see that the plane flew progressively farther off course as it made its way past the Nabie, Nukks, Neeva, Ninno, and Nippi waypoints. At Neeva, KE007 was 150 miles off track. That's where Soviet radar first picked it up, its track confused for a while with that of a US Air Force RC-135 from Shemya, in the Aleutians, which the Russian controllers had noticed on their screens earlier.

By Nippi, it was 185 miles off course. But still KE007's crew didn't know it, because the lights come on as long as the airplane is within 200 miles of the waypoint. At 1709 Greenwich mean time (GMT), Sohn apparently saw his amber lights go off and radioed Tokyo: "Overhead Nippi one seven zero seven Zulu, level three three zero, fuel one three two, temperature minus four niner, wind three two zero at four five knots, estimating Nokka one eight two six Zulu."

In English, this means that Sohn was claiming that the flight had crossed the Nippi waypoint just before, at 1707 GMT (when it was actually 185 miles to the north and close to Petropavlovsk in Kamchatka); that it was at 33,000 feet, with 132,000 pounds of fuel remaining, an outside temperature of minus 49 degrees Celsius, and a 45-knot wind coming from 320 degrees (approximately northwest). Sohn was also reporting that KE007 expected to be at Nokka by 1826 GMT. Tokyo ground controllers took Sohn's word for it; they had no way of knowing that the plane was off course.

More than an hour later, Sohn waited for the amber lights to signal that Nokka was coming up. But KE007 was now far more than 200 miles off course, so this signal never came. Flight KE007 was 365 miles off course when the Soviet Air Force "terminated" it.

When the errant plane had first flown toward Kamchatka, Soviet controllers, believing it to be a RC-135, assumed that it would turn tail just before entering Soviet airspace. When it flew straight across the peninsula, fighters scrambled. But at 33,000 feet and 520 knots, KE007 was safely in international space over the Sea of Okhotsk by the time fighters got close.

When the plane continued on a straight course, Soviet defenses were waiting for it. By the time it reached Sakhalin, three Sukhoi-15 interceptors were in the air. At 1812 GMT, while Sohn was waiting for the amber lights to signal the threshold of Nokka waypoint, one Soviet pilot, overheard by the Japanese, was telling his ground control: "I have visual contact."

Around this time, Japan's Air Self Defense Force Radar picked up a blip of KE007 passing over Sakhalin at a point about 45 miles north of their screens at Wakkanai. The Wakkanai controllers assumed that it was a Russian plane.

Now only a few minutes remained for all the mistakes to be made and to come together in one terrible finale in the predawn of a Siberian night.

There was a half moon. On board the 747, the dinner and film were long over, and most of the passengers were dozing behind closed porthole blinds. The pastel-yellow panel lights on the flight deck were not visible from the outside, but the aircraft's wingtip navigation lights were on and the red anti-collision beacon on the fuselage was rotating.

A Soviet pilot said at 1821 GMT: "The target is at 10,000 meters (32,500 feet), flying 240 degrees."

From here on, the only recordings available are of one Soviet pilot, identified to this reporter by intelligence sources as Major Vasiliy Konstantinovich Kazmin, responding to his ground controller. The ground controller's comments were not recorded.

First, Kazmin complained that "the target is not responding," implying that he had tried to contact the airliner on the international emergency frequency, to which one of the 747's VHF radios should have been tuned. But these, we know, were not working well.

Then Kazmin snapped: "Locked on," meaning that the Su-15's two AA-2 missiles, which have the NATO code name Anab, had been targeted to the exhausts of the airliner's engines.

Then, in response to some instruction, the Russian major said: "Broken off lock-on. Firing cannon bursts"—presumably a warning measure, using tracers, suggested by the ground controller.

Chun, Sohn, and Kim, their heads down in the cockpit, apparently saw nothing, at least at first; and since Kazmin apparently fired his tracers from behind and below the 747, instead of alongside, there is little chance they could have seen them.

A minute before, shortly after 1820 GMT, KE007 had requested an altitude "step" from 33,000 to 35,000 feet; the craft could fly more economically at a higher elevation. Tokyo authorized the climb, which slowed the aircraft's speed. Major Kazmin's own speed remained constant, and recordings show that he unintentionally overtook his target. This situation offered him the best opportunity to carry out the international requirements for making an intruding plane follow an air-force escort to the ground—moving in front and to the left, where the civilian pilot can see the escort, and waggling the fighter's wings.

Instead, Kazmin was soon saying: "Now I have to fall back a bit. . . . Say again? . . . I am dropping back. . . . Now I will try rockets." Was he deliberately staying out of the airliner's sight, thirsting for a kill? The evidence grimly raises that suspicion.

At 1825 and eleven seconds, the Soviet pilot said: "Understood. I am locked on. Target is at eight kilometers."

Five seconds later, he said: "I am closing on the target. I have already switched on." A few kilometers away, copilot Sohn must still have been wondering why the lights announcing Nokka had not yet lit up.

There is no indication the crew knew they had been hit by a missile, only that all four engines were out.

At 1826 GMT—Sohn's estimated time for passing Nokka—Kazmin told his ground control: "I have executed the launch. . . . Target destroyed."

At 1827, Sohn was talking to Tokyo. The message was garbled, and Tokyo tried to call the plane on two other frequencies. What is preserved is: "Rapid decompression. . . . All engines. . . . Rapid decompression. . . . One zero one two delta. . . ." There is no indication that the crew knew their plane had been hit by a missile—only that all four engines were out and that there was a loss of cabin pressure caused by the entry of outside air. "Delta" is thought to refer not to the letter D, but to the finally noticed presence of the Soviet Sukhois—planes with delta wings.

In the waters between Sakhalin and Moneron Island, the 99-ton Japanese squid trawler *Chidori Maru 58* heard an explosion above. The blip of the KE007 took three minutes to go off the Wakkanai screens, indicating that the pilots wrestled with the plane before it finally dived into the water.

All that day, and for days afterward, the western world erupted in anger. The Kremlin did not help by a series of contradictions and evasions. The Soviet pilots who had intercepted the 747 gave the lie to their own government's claim that the airliner was not showing lights, that visibility was difficult, and so on. Marshal Nikolai Ogarkov, the Soviet chief of staff, made the improbable claim that the order to shoot down the plane had been given by a "local commander," with Moscow

only being "informed later."

Actually, according to intelligence sources, the order probably was given by General Vladimir Govorov, commander of Soviet Far East Forces, at the request of Colonel-General Semyon Romanov, chief of staff of the Air Defense forces. Romanov had had to put off the SS-X-24 test because of the foreign intrusion into Soviet airspace, and was probably not in the best of late-night moods.

Initially, the Soviet pilots probably did mistake the 747 for an RC-135, a military version of the Boeing 707. Viewed from behind and below—the normal attack position—the raised flight deck and lounge of the 747 would not be visible; the similar designs of the two Boeing planes would be indistinguishable in perspective, especially at night. But Major Kazmin eventually flew alongside and in front of KE007 before shooting it down, and by then had reported the flashing lights of a civilian passenger plane.

Using an "intelligence" pretext to shoot down airliners is not new. In 1951, a Constellation of Israel's El Al, flying over Bulgaria on its way from Vienna to Tel Aviv, was mistaken for a US military Constellation, fired on, and forced to land. In 1971, Israel itself earned global opprobrium by shooting down a Libyan airliner that had crossed the Suez Canal in a sandstorm on its approach to Cairo. It was over Egyptian territory occupied at the time by Israeli forces. All but thirteen aboard died, including the French captain.

In April 1978, KAL flight KE902 was fired on and forced to land on a frozen lake near Murmansk after losing its way on a flight from Paris. It was 200 miles inside the Soviet Union. Two passengers were killed by the Russian bullets.

Because of the 1951 confusion between a spy plane and an airliner, and the mendacious Israeli and Soviet claims to the same confusion in 1971 and 1978, many Americans and others were tempted to accept the Moscow story that KE007 was on a spying mission. More Machiavellian theorists postulated that the aircraft was genuinely lost, but that the US Air Force had let it fly into Soviet airspace without warning it, in order to get a picture of Soviet reactions and countermeasures. The International Civil Aviation Organization referred all the theories for the plane's invasion of Soviet space to its Air Navigation Commission, which rejected the intelligence-mission explanation as fanciful. Even beyond the technical evidence, the notion that an airliner with two or three hundred civilians aboard had been intentionally used as a decoy for Soviet defenses never had much merit in the first place, except for the sort of people who believe that John F. Kennedy was shot by the freemasons. An RCV (remotely controlled vehicle, or pilotless plane) would be much more efficient than a 747. These tiny craft are hard to hit and cheap enough to be expendable, while still capable of triggering defenses.

The Air Navigation Commission found no evidence that either Tokyo control or the plane's crew had been aware of any deviation from course, although it pointed out that the crew should have followed "company procedures" to verify whether it was on track. The airliner, the commission said, had no excuse for being lost except "a considerable degree of lack of alertness and attentiveness on the part of the entire flight crew, but not to a degree that is unknown in international civil aviation." The commission scored the use of force against the plane and Moscow's refusal to accept an international investigation team.

The Soviet Union deserved condemnation for its murderous overreaction. But KE007 was trespassing. Why?

Obviously, the Soviet Union deserved condemnation for its murderous overreaction, and for its subsequent obfuscations. But KE007 *was* trespassing. Why?

Summing up, the Air Navigation Commisssion discounted "unlawful interference [i.e., hijacking], crew incapacitation, deliberate crew action associated with fuel-saving incentives, or extensive cockpit avionics/navigation systems failures or malfunctioning."

It is on the third point that the report probably goes wrong. "Deliberate . . . action associated with fuel-saving" means short-cutting to earn Korean Air Lines bonuses for using less fuel than a flight normally required.

Former KAL pilots are reluctant to impugn the professional honor of Captain Chun and their other dead comrades on the flight, and they will only speak if they are not identified. Most, being pensioners of the airline, are afraid to speak at all; but those who agreed to talk to me were all agreed that short-cutting to win the company's fuel-saving bonus was customary, in pre-Sakhalin days, and that it was normally a risk-free enterprise.

The pilots say that when programming the INS computer, standard procedure was to replace the last reporting point—Daigo—by the Seoul coordinates, reporting "overhead Daigo" while they were actually far north of the Daigo beacon, cutting straight across Hokkaido and the Sea of Japan to the Korean coast, saving thousands of pounds of fuel on the four big engines, and earning hundreds of dollars each in bonus money for the three pilots.

Both KAL and the Air Navigation Commission dismiss the short-cutting theory. They conclude that short-cutting would have been noticed, either on radar at the time or by examining other technical data afterwards. But all the reasons for rejecting the short-cutting theory presuppose that short-cutting would take place all along the route. In fact, as the retired KAL pilots told me, the usual practice was to cut short only the final leg. (See map on page 149.)

But why was KE007 so far off course for so long—a remarkable five hours and 26 minutes before being shot down? Many analysts, including the best local reporter on the issue, Michael Westlake, managing editor of the *Far East Economic Review* in Hong Kong, lean toward the so-called "heading mode" theory, one of two possibilities cited by the Air Navigation Commission.

This theory assumes that, by leaving a switch in the wrong position, the pilots flew *all night* the heading they had set themselves to go from Anchorage to Bethel ("heading mode") instead of the one determined by the inertial navigations computer ("INS mode") to follow route R20.

The commission's report says: "In such a situation, with the INS system activated, although not controlling flight navigation, the crew would have been provided with regular indications of flight navigation waypoint passages at or near the flight-plan estimates for such passages and would therefore have been under the impression that they were navigating in the INS mode." The second possible explanation, said the Commission, was that someone got one digit wrong when programming the INS computer, putting Anchorage ten degrees of longitude—600 nautical miles—east of where it really is. Such an error would have thrown KE007 badly off course on its first leg, but not thereafter.

The crew presumably thought, in its last moments, that it was off Hokkaido, because it had set its transponders at 1300—a distance-measuring frequency used in Japanese airspace. And they presumably thought that they were in "INS mode," not "heading." And perhaps they were.

The possibility that the navigating

system was on "INS," and neither malfunctioning nor functioning as the pilots expected it to do, and that no punching error was made during the programming, seems to have been overlooked except by other KAL pilots, with whom I talked. If we go to the manual for the Litton LTN-72R INS, we learn that this scientific marvel "can be aligned [on geographical coordinates] *only when stationary on the ground.*" (Emphasis added.)

As the manual warns, if Sohn or Kim

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or Chun himself was still aligning the n. tional INS after the 747 began to ta Anchorage—that is, if the aircraft beg to move before the feeding of coor inates was completed and the switch finally turned to "INS"—this would, in the manual's words, "make the output of the system unpredictable."

Inserting destination coordinates as the final "way station" while the plane was moving would probably, the manual says, make the navigation system bypass the other waypoint coordinates and "track" directly to destination—in this case, Seoul, using the direct route that trespasses Soviet airspace.

This would explain why the aircraft went off course to the north from the start, moving progressively away from its ack and keeping its nose pointed essly, like a homing pigeon, to- Seoul. The crew, however, would ha e believed they were safely on track, and would have realized that something was wrong only when the amber lights announcing the Nokka checkpoint did not appear. By then, with Major Kazmin flying underneath their tail, it was too late to do anything about it.

Says a leading American businessman in Seoul: "I don't think anyone here doubted, from the start, that short-cutting to earn the fuel bonus was the explanation." Said General Keegan, the former USAF intelligence chief, at the time: "I have never failed to be surprised at how careless the Koreans are. Despite the risk of flying near Soviet airspace, the Koreans continued to fly too close. They continued to bruise the Soviets on this. What happened [at Sakhalin] they invited."

That's going too far. If all had gone well, KE007 would simply have flown across Hokkaido instead of Honshu, and would have come a little close to North Korea in the final minutes.

That KE007 was off course unintentionally because it intended to be off course later—with the short cut—cannot be proved. But that explanation alone seems to fit the evidence.

The airline, even if not plagued by lawsuits, would prefer a mechanical error for which the computer manufacturer could be blamed. The next best would be "innocent" pilot error. Any error based on a questionable intention—in this case, short-cutting, to earn the airline's fuel-saving bonus—is unacceptable, and the company is all but silent on the subject.

The Sakhalin tragedy of September 1983 was followed by the crash of a Korean DC-10 freight plane at Anchorage in December, injuring seven. The following month, January 1984, a KAL plane skidded off an icy runway at Seoul Airport; no one was injured.

Shortly after all these mishaps, KAL took a number of steps that were almost surely related to Sakhalin: First, it quietly abolished the fuel-saving bonus that for years had been an inducement to short-cutting; then, to reduce the risk-taking associated with ex-military pilots, fourteen of these were discreetly forced to resign. All remaining flight crews went through a retraining process.

Cho Chung-kon (known as Charlie Cho), who was 51 at the time, took over as president of the company from his 64-year-old brother, Cho Chung-hun (known as Harry Cho), who became chairman. Several top cadres were reshuffled. Korean Air Lines changed its name to Korean Air, and the planes got a new livery. Flight 007 had already become flight 017.

The airline is still in search of its reputation. Seasoned globetrotters would agree that it is not in the same class as Singapore Air, Japan Air, Thai International, or Air India. But it is the world's tenth largest (and sixth among freight carriers), with 38 planes and more than 2,000 flight-deck and cabin staff, and its service reputation, while not at top Asian standards, is probably better than that of any American airline. Although the airline's record on safety is probably as good as that of any one of its size with such extensive routes, it is now anxious to establish a record for caution.

The tragedy at Sakhalin has produced some good. It has forced the US Air Force to cooperate on the Pacific route. At Shemya, American civilian and air-force controllers now work together. Because the northern edge of R20—the track from Anchorage to Seoul that KE007 supposedly was flying—comes within eleven miles of Soviet airspace, all cases of aircraft flying more than eleven miles off course are now reported to the pilots. Since November 1983, there have been 38 such incidents, including two planes that were more than 25 miles off course. Since December 18, 1984, there has also been an exit radar on St. Paul's Island, to help airliners "track out" from Alaska.

Korean Air, Litton Industries, and the US government are being sued in Washington and Tokyo; one issue is whether the federal government "has a legal duty to warn or advise civilian aircraft [that are] off course." At Korean Air's request, the US District Court in Washington has ordered the Federal Aviation Adminstration not to answer press questions, and Korean Air has given its employees a choice between silence and unemployment.

Lloyds has paid Korean Air $35 million as "hull insurance" on the lost plane.

The airline carried $400 million of insurance with Lloyd's; claims brought by the kin of victims total about $2.3 billion. Korean Air has normally refused to pay more than $75,000 per victim; it has, however, paid 80 million *won* (about $100,000 at the time) to a Korean legislator whose daughter perished in the crash.

Those who may have known for sure what happened are scattered along the deep floor of the North Pacific. Two of the victims, deputy purser Kim Yak-kun and flight attendant Suh Jong-suk, were engaged, and were married posthumously by their families. One of his suits and her traditional *han-bok* dress were buried together. Another stewardess on the flight, Cho Hyong-sim, also was married posthumously to her fiancé, Kim Bon-chon, who was a passenger on KE007.

Captain Chun's widow, Kim Ok-hi, never accepted the easy explanation of pilot error, advanced by the airline and the Air Navigation Commission. I think that she was right. The man whom she remembers as insisting that everything in the house be in the right place was not incapable of a mistake, she says, but he would not have left a switch in the wrong place for six hours, especially with two other pilots to help him.

She says his son, now ten, plans to be a pilot. What better way could his father's ghost be put to rest? Like all pilots of our generation, Chun was familiar with "unforgiving" planes—the ones that must be flown strictly according to the book. Now we would seem to have a new problem—unforgiving navigation computers. □